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ABSTRACT

This paper describes the technology and benefits of distance education, especially microcomputer-assisted programs, for isolated schools with limited access to certified teachers. An interactive system known alternately as audiographics teleteaching and microcomputer-aided teleteaching was recently introduced at Brigham Young University's (BYU) Hawaii campus. The purpose of BYU's "Hawaii Computer-Aided Teleteaching Project" is to acquaint Pacific public and private school administrators with a low-cost distance-learning system. The system is easy to install, promotes local control of the curriculum, and allows for high levels of teacher-student interaction. Audiographics teleteaching is the least expensive among technologies permitting live exchange, and requires the least software, training, and maintenance. Audiographics, chiefly a microcomputer-based system, is generally used in collaborative arrangements between two or three schools. Among its major strengths are its perpetuation of small classes, local control, teacher-student interaction, and organization of the material. Weaknesses are: the lack of moving images, the potential for electronic interference, and the small size of computer screens. Initial costs for participation in an audiographics cooperative need not exceed $5,000 per site and operational costs are simply the monthly telephone charges. The document includes six references and a manufacturer's overview of the computer-aided teaching system. (TES)

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THE POTENTIAL BENEFITS OF AUDIOGRAPHIC TELETEACHING AMONG ISOLATED SCHOOLS IN THE PACIFIC BASIN

Paper Presented at the
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THE POTENTIAL BENEFITS OF AUDIOGRAPHIC TELETEACHING AMONG ISOLATED SCHOOLS IN THE PACIFIC BASIN

Description

The 1980's have witnessed keen interest in distance learning projects utilizing telecommunications technologies such as satellites, microwave, cable television, fiber optics, and microcomputer networking. Fueled by state sponsored curriculum reform intended to improve quality in American education and equity in its distribution, the interest in distance education shown by national and state education officials is expected to continue through the 1990's and beyond. In geographically remote and isolated schools where a certified teacher is not always available or in schools (rural or urban) where limited student enrollments make hiring teachers for low incident courses cost prohibitive, instruction via some form of distance learning may be the "next best thing to being there " (Barker, 1987).

Of the distance learning technologies currently available, the greatest attention has been focused on interactive satellite systems and on microwave TV systems, most of which permit live one-way video, two-way audio teacher/student interaction. Both technologies require sizeable investments in equipment outlay and in maintenance and operation. While it is true that hundreds of students could receive instruction simultaneously via either satellite or microwave technologies, local school control of the curriculum and direct supervision of the "electronic" or the "master" teacher is severely minimized. Furthermore, large class size significantly reduces opportunities for teacher/student interaction.

An interactive telecommunications system known alternately either as audiographics teleteaching or microcomputer-aided teleteaching has recently been introduced at Brigham Young University-Hawaii. With a $9600 grant from TSN Systems, Incorporated of Boiling Springs, Pennsylvania, BYU-Hawaii has established the "Hawaii Computer-Aided Teleteaching Project." The purpose of the project is to acquaint public and private school administrators across Hawaii and the Pacific with a low-cost "distance learning" system that is easy to install and maintain, promotes local school control of the teacher and the curriculum, and allows for high levels of teacher-student interaction during the instructional process. Microcomputer-aided teleteaching promotes live, interactive

audio/video teaching from a host site to remote sites using microcomputers, speaker telephones, and facsimile machines as the communication channels. The system can be used as a delivery mechanism for teaching either credit or enrichment courses in which only a few students enroll, or for which a certified teacher might be shared "electronically" between two or more schools. Types of courses which might be offered via audiographics include inservice training, staff development, college credit courses, high school credit courses, etc.

Background Information on Audiographics Teleteaching

Among the distance learning technologies which permit live exchange of visuals, voice, and data, audiographics is the least expensive in terms of equipment and software requirements, training of teachers, and maintenance and operation (Bradshaw, 1989; Ellertson, 1987; U.S. Congress, 1989). Audiographics is chiefly a microcomputer based system which incorporates computer-generated graphics that function much like an electronic chalkboard. The system requires specially designed telecommunications software that is available for MS-DOS microcomputers. The telecommunications software allows the user to create computer graphics and multi-sized text called "slides" which can then be transmitted in real time from one machine to another. Once on-line with other compatible PCs, the system operates on a "common screen" basis -- that is, whatever graphic or textual material (slide) is executed from the host screen/monitor (location) automatically shows up on all the other screens (distant locations) simultaneously. Visual exchange of slides is in a still-frame mode. Motion is not possible except in a limited sense when using a graphics tablet. The distance between the computers may be only two yards or 12,000 miles. It does not matter. Computers are linked over regular telephone lines for two-way visual exchange of text and/or graphics. Two-way audio interaction between the teacher and students at distant sites is via speaker telephones, also over regular telephone lines. With the use of a video-speaker phone, students and teacher(s) would be able to visually see each other. Use of a facsimile machine permits exchange of instructional handouts and/or student written work.

The model for audiographic teleteaching is usually a collaborative arrangement between two to three schools or institutions to form a cooperative. The "network" co-ops human, financial, and equipment resources. Each member has an equal voice in determining curriculum content, scheduling, selection of the teleteacher, etc. Cooperatives can be formed and dissolved on an as-needed basis from a larger consortium of telecommunication partners, but the focus remains one of local control and small class size. Inasmuch as cooperatives are typically

limited to networks of two to three schools linked together, small class size is guaranteed. In present on-going audiographic teleteaching cooperative networks, the average class size ranges between 4-15 students with class size seldom exceeding 30 students overall (Wydra, 1987). This guarantee of small class size ensures greater opportunity for both teacher/student interaction and student/to/student interaction. Students are able to interact not only with their teacher, but also with other students at different sites. Along with teacher/student interaction, the opportunity for student/to/student interpersonal communication between all sites -- albeit electronic-- is a major advantage of this approach to distance education in contrast to most other telecommunications delivery systems. The prospect of student/to/student exchanges not only increases the likelihood of socialization between students, but also fosters the potential for peer tutoring and small group study.

Strengths of Audiographics Teleteaching (summary)

Among the major strengths of this approach to telecommunicated distance education are: (1) Local schools maintain control of the master teacher, programming, and scheduling; (2) small class size is guaranteed; (3) the system supports student/to/student interaction between sites in addition to teacher/student interaction. Via the speaker telephones, students at different sites can talk to each other as well as their "distant" teacher. A summary of these and related benefits follow:

1. Low cost in terms of hardware, software, and maintenance.

2. Relatively simple to learn and to operate.

3. Perpetuates (a) small class size for interpersonal interaction, and (b) local school control of the teacher and the curriculum.

4. Permits not only teacher/student interaction, but also allows for student/to/student interaction.

5. Any participating site can serve in either a "receive" or a "transmit" mode.

6. Instructional content is focused more on the organization of the material than on the personality of the teacher.

7. Operates over regular telephone lines. Therefore, linkages between distant sites can be made almost anywhere in the world.

8. Low operational costs -- limited to monthly telephone charges.

9. Exchange of handouts or student written work via facsimile machines promotes a prompt "turn-around" for homework assignments between the instructor and students.

Weaknesses of Audiographics Teleteaching (summary)

As is true of all other distance learning technologies, this approach to instructional delivery is no educational panacea. Among its disadvantages are the following:

1. Motion is not possible.

2. The instructor cannot see the student, nor can students see the instructor or other students at distant sites.

3. Extraneous noise or interference can cause voice transmission on the speaker telephones to occasionally "break up."

4. The video graphics/image displayed between computer monitors is limited to the size of the computer screen unless additional hardware (TV monitor) is added.

5. Lesson planning (creating of computer visuals) can be considerably time consuming for the teacher, and floppy disks must be distributed to all remote sites prior to transmission.

Costs Associated with Microcomputer-aided Teleteaching

Initial equipment costs for schools to participate fully in an audiographics cooperative network need not exceed $5000 per site. Major equipment items per site include an MS-DOS microcomputer (minimum 640 K RAM, preferably with a hard disk of 20 to 30 megabytes); either a CGA, EGA, or RGB monitor; a 1200 or

2400 baud modem, a graphics tablet, a speaker telephone, a printer, a facsimile machine, and access to regular telephone lines. Special telecommunications software is needed to create computer graphics and text for visual exchange between the host and receive site screens. Four vendors currently produce telecommunications software for audiographic applications. Software prices vary between vendors with ranges running from $1000 to $4000 (Barker, 1989; Bradshaw, 1989). Appendix A of this paper provides information on TSN Systems, Inc. telecommunications software for computer-aided teleteaching and outlines a configuration of basic hardware requirements.

Operational costs are simply the monthly telephone charges. In Hawaii, this is minimal provided the participating sites are linked on the same island. In instances of off-island linkage, the operational costs would be the monthly telephone charges as well as long distance tolls. Hence, the second and subsequent years of operation of a school's audiographic teleteaching system would typically be very low cost.

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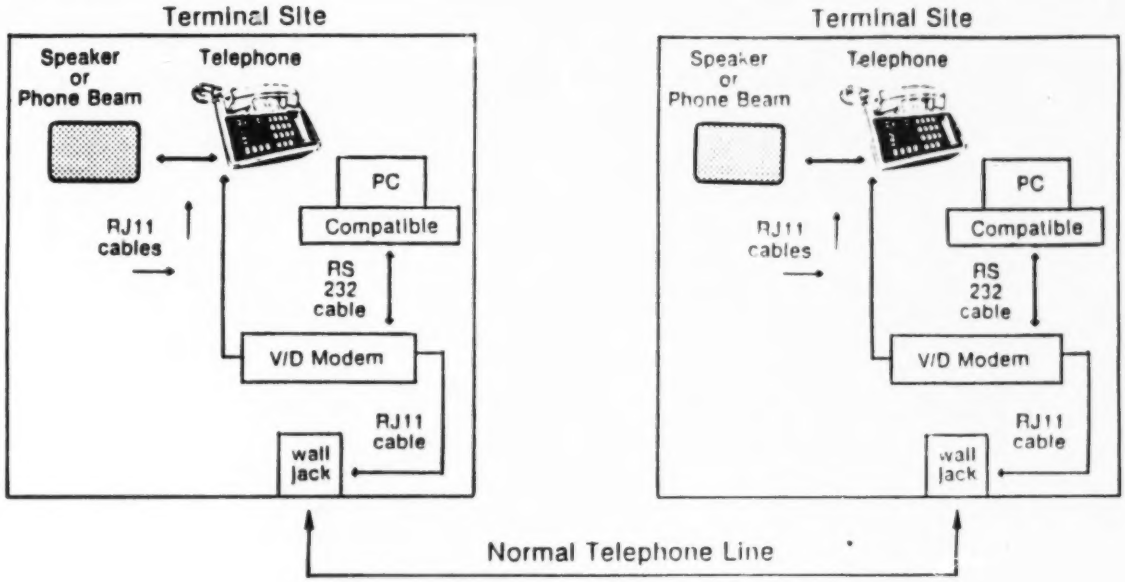
Appendix A

COMPUTER-AIDED TELETEACHING SYSTEM SITE CONFIGURATION
MS-DOS CGA Version 1.0

Brigham Young University-Hawaii has established the Hawaii Computer-Aided Teleteaching Project with a grant from TSN Systems, Inc. of Boiling Springs, Pennsylvania. Computer-aided Teleteaching permits live, long distance teaching from a host site to multiple receive site locations. Communication is over regular telephone lines. MS-DOS computers are used for two-way visual interaction of instructional content, speaker telephones are used for two-way voice interaction, and facsimile machines are used for exchange of homework and handouts.

The graphic below depicts specifications for a voice/video link between <u>two</u> sites. Inclusion of a facsimile machine would allow for exchange of handouts and/or homework.



Two (2) Site Minimum Needs:

(2) Computers (AT, XT, PS-2, or compatibles)
(2) Speaker telephones. The Hawaii State Department of Education is already in the process of installing Luma video/speaker telephones in public schools throughout the state.
(2) Hayes compatible modems
(2) TSN Computer-Aided Teleteaching Software
(2) Graphics tablets
(2) Digitizing scanners
(2) Facsimile machines
(2) Regular pulse tone telephone lines

TSN Systems, Inc.

COMPUTER-AIDED TEACHING SYSTEM
MS-DOS CGA

OVERVIEW

— TSN Systems' Audio-Graphics Tele-Teaching System operates over either ONE or two standard dial up telephone lines per site using MS-DOS computers. The system is Menu and Icon driven and may be operated with keyboard, light pen, digitizing tablet or mouse. A text editor is included for memos, tests and other short documents. Multiple monitors may be used at the same time for better viewing.

ECONOMICAL

- Lowest up-front costs
- Lowest ongoing operational costs
- No need for special telephone lines
- No need for expensive bridging services
- No need for expensive bridging equipment
- No need for expensive peripheral boards
- No need for expensive special monitors
- No need for extra software production programs

GRAPHICS FEATURES

- 16 background colors
- Foreground colors come in four palettes of four colors each
- 320 x 200 screen resolution - CGA
- 8 brush types
- Draw, erase freehand and full-screen erase
- Geometric shapes including lines, square, rectangle, triangle, circle and fill
- English, Greek, Spanish, French and German labeling fonts are on-line in four sizes
- 8 direction pointer
- Rubberbanding while making geometric shapes
- A fill routine to fill any closed shape
- Up to 60 slides per 360K disk
- Screens may be dumped to printers
- Optional video digitizing devices allows printed graphics and pictures to be captured and saved

COMMUNICATIONS FEATURES

- Single line voice/data or dual line (one for voice and one for data)
- Two or more sites can be networked together
- Connecting and hanging up procedures are very easy
- Graphic communications control is always interactive. One site has control, the others receive. Control may be passed to any other site as needed
- Graphic communications functions are all interactive. As the controlling site performs a graphics function, the remote sites receive it in real time
- Files, both text and slides, may be transmitted to the remote sites
- Interactive audio on-line at all times
- Two second slide change at remote sites
- Classroom networking without modems
- Organized lessons are created by sequencing slides into slide shows

OPTIONAL ITEMS — PER SITE

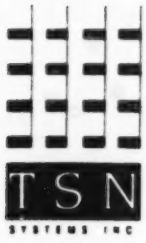
PHONE BEAM SPEAKER PHONE WITH A PULSE/TONE PHONE
LUMA PHONE (picture phone)
PRINTER
FAX MACHINE
3-DAY IN-SERVICE TRAINING
COMPUTER-EYES VIDEO DIGITIZING (teacher site only)
SCANNER

MINIMUM MS-DOS SITE CONFIGURATION

- MS-DOS compatible PC computer with CGA monitor
- Two floppy drives, 360K
- Parallel port
- 256K ram (usable for CATS program)
- One serial port
- Pulse/Tone phone
- Speaker for phone
- Modem

RECOMMENDED MS-DOS SITE CONFIGURATION

- MS-DOS Compatible AT type computer with EGA monitor or PS-2
- One 1.2 M floppy drive
- 10 or 20 MB hard drive
- Parallel port
- 640K ram
- Two serial ports
- Phone beam speaker phone
- Pulse/Tone phone
- Light pen with board, digitizing tablet or mouse
- Scanner
- Modem



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